FNU FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY

SCHOOL OF MECHANICAL ENGINEERING

TRADE DIPLOMA IN RENEWABLE ENERGY

EEE566-ELECTRICAL MACHINES DRIVES and CONROLS

FINAL EXAMINATION – TRIMESTER 1 -2018 DURATION: 3 HOURS

INSTRUCTIONS TO STUDENTS:

1. You are allowed 10 minutes extra reading time during which you are not allowed to write.
2. Begin each **SECTION** on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each answer sheet.
4. Insert all foolscaps, graph paper, drawing paper etc in their correct sequence and secure with string.
5. For all sheets of paper on which rough / draft work has been done, cross it through and you must attach to the answer booklet.
6. Write clearly the number(s) of the question(s) attempted on top of each sheet.
7. **ATTEMPT ALL QUESTIONS.....TOTAL = 100 MARKS**

SECTION A **(40 MARKS)**

1. Identify the different five (5) types of dc machines, classified according to how their field flux is created. (5 marks)

2. Draw the diagrams of the various degrees of compounding in DC machines and show their characteristics. (8 marks)

3. Determine the armature-generated voltage of a 220 V generator that has an armature current of 350 A and an armature resistance, including brushes of 0.02 ohm and a series field resistance of 0.004 ohms. (4 marks)

4. With the aid a diagram outline the principles of action of a transformer. (4 marks)

5. Discuss the paralleling requirements of 3-phase transformers.(3 marks)

6. Outline the principles of an induction motor and identify the application of Fleming's left-hand motor rule. (6 marks)

7. With the aid of a diagram outline the current – voltage characteristics for a silicon and a germanium diode. (3 marks)

8. Draw a fully labeled equivalent circuit of a transformer. (5 marks)

9. Draw fully labeled diagrams of N-P-N transistor showing the structure and symbol. (2 marks)

SECTION B **(60 MARKS)**

1. (a) Draw the fully labeled circuit diagram of a separately excited generator (4 marks)

   (b) Determine the armature-generated voltage of a 220 V generator that has an armature current of 350 A and an armature resistance, including brushes of 0.02 Ω and a series-field resistance of 0.004 Ω. (2 marks)

2. Outline the phase shifts of the four (4) main connections of three-phase transformers. (6 marks)

3. . If a 415 V, three phase transformer has 200 turns per phase on the primary windings and 40 turns on the secondary, find the output line voltage for each of the main types of connection. (10 marks)

4. (a). Name the six (6) single phase motors that you know of. (6 marks)

   (b). Calculate the speed of a 4-pole single phase motor if the slip at full load is 3.4 %. The line frequency is 50 Hz. (6 marks)

   (c). Draw a fully labeled equivalent circuit of a single phase motor. (3 marks)

5. (a) List the main components of a dc machine. (6 marks)

   (b) With the aid of fully labeled diagrams to show the electrical connection, and motor characteristics explain how a shunt motor operates. (5.5 marks)

   (c) Explain how the reversal of rotation is achieved. (1.5 marks)

6. With the aid of fully labeled diagrams outline the action of a full – wave bridge rectifier. (10 marks)

The End